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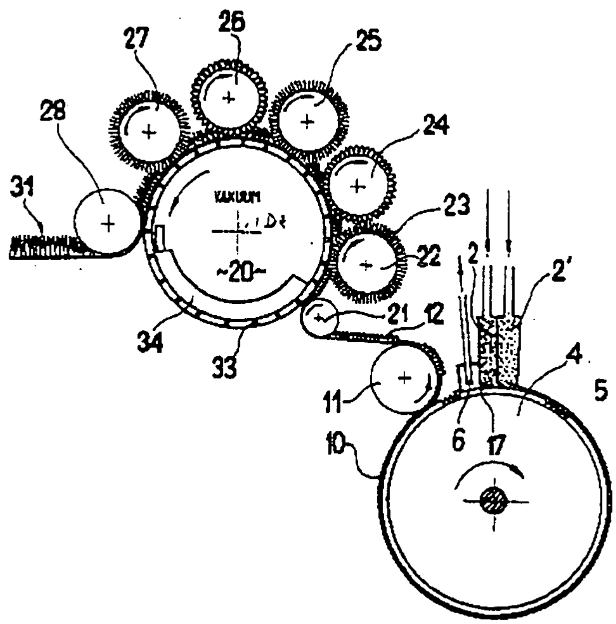
(54) **PROCEDE PERMETTANT DE FABRIQUER UN PRODUIT SEMI-FINI DE TYPE FEUILLE, A SURFACE STRUCTUREE, A PARTIR D'UN THERMOPLASTIQUE, ET PRODUIT SEMI-FINI FABRIQUE SELON LEDIT PROCEDE**

(54) **METHOD FOR PRODUCING SURFACE-STRUCTURED, FILM-LIKE SEMI-FINISHED PRODUCT FROM A THERMOPLASTIC AND SEMI-FINISHED PRODUCT PRODUCED ACCORDING TO SAID METHOD**



(57) L'invention concerne un procédé qui permet de fabriquer un produit semi-fini (31) de type feuille, à surface structurée, à partir d'un thermoplastique. On applique un matériau thermoplastique à l'état fondu ou sous forme de feuille sur une surface (5) présentant de fines cavités et constituant une structure négative (matrice) par rapport à la structure souhaitée. Après durcissement, on retire le matériau plastique de la surface, de façon que le matériau thermoplastique qui avait pénétré dans les cavités et qui en est retiré forme un voile (12) constitué de protubérances. On étire les protubérances constituant le voile (12) par peignage, brossage, raclage et/ou pincement par cisailles (22-27), de façon à accroître sensiblement leur longueur.

(57) The invention relates to a method for producing a surface-structured, film-like semi-finished product (31) from a thermoplastic. According to said method a thermoplastic material is applied in a molten state or in the form of a film onto a surface (5) having fine cavities corresponding to the inverse structure (matrix) of the desired final structure. After solidification the plastic material is withdrawn from the surface so that the thermoplastic material which was introduced into the cavities and withdrawn therefrom forms a pile (12) consisting of protuberances. The protuberances constituting the pile (12) are elongated by combing, brushing, knife-coating and/or shear pinching (22-27), which significantly increases the length of the protuberances.

Method for Producing Surface-Structured, Film-Lik Slmi-Finished Product from a Th rmoplastic and S mi-Finished Product Produced According to Said M thod

The invention relates to a process for manufacturing a filmlike surface-structured semifinished material from a thermoplastic, with processing steps in accordance with Claim 1. The invention also relates to products manufactured according to that process, and to an arrangement for implementing the process.

EP 0 057 590 A2 describes a surface provided with a nap. The nap is produced by freezing the material, treating it with a brush to produce the nap and subsequently thawing the surface.

From EP 0 199 126 A2, a plastic surface is known that has a fiberized surface. The still unfiberized plastic surface is worked into a viscoelastic or plastic state so that plastic components can be pulled out. For this, a matrix is brought in contact with the plastic surface, and the matrix is pulled from the surface, resulting in fiberization.

From DE 195 24 076 C1, which constitutes the closest prior art, it is known to manufacture a filmlike surface-structured semifinished material from thermoplastic by extruding thermoplastic material in molten condition onto a cylindrical rotatable and temperature-adjustable roller surface, whereby the thermoplastic material is in full contact with the surface structure of the roller surface. The molten thermoplastic — while still lying on the surface — is solidified through cooling. Due to the fine cavities which exist, the resulting semifinished filmlike material takes on a nap-like or web-like surface.

Also known (from US-PS 1 881 337) is a method of transferring a rubber film, which is filled with a fibre admixture, to a mat with a fibrous surface by first embossing the rubber surface which results in high-profile and low-profile areas. The high-profile areas are, for example, are treated with brushes, whereby part of the rubber is removed and the fibre structure is peeled out. The lower-profile areas are not removed. This process is based on th fact that fibers hav to be admixed to an elastic bas substance, so

that after removal of a surface layer a fibrous surface is created again.

It is also known to emboss plastic films or to form them in a deep-drawing process. However, with such processes, it is difficult to provide the plastic film with long thin hairs, because it is very difficult to pull the film hairs undamaged from the correspondingly deep cavities of an embossing or deep-drawing tool. Experience has shown that a certain percentage of plastic film hairs always remains caught in the cavities, which means that they are unavailable for forming after a short while, rendering the form and thus the resulting product unusable.

On the other hand, naps or protuberances whose mean diameter is exactly as large or up to half as large as the length of the protuberances can be produced in such matrix molding processes; the same applies to deep-drawing.

It is therefore the objective of the invention to use a thermoplastic without the admixture of heterogeneous components such as fibers, in a molding or feeding process, to produce a semifinished material which not only has a nap-like structure, but also a substantially fine-fibre or hair-fibre, velour-like surface.

This objective is achieved by means of the process mentioned above, characterized in that the protuberances which form the pile are stretched by combing, brushing, doctoring and/or shear-squeezing, whereby on average, the protuberances of the pile are at least doubled in length, in relation to their original length, resulting in a semifinished material with a fibre-like structure on at least one side, on which the protuberances are lengthened into hair fibers.

In contrast to gigging, which is known in the textile industry, where individual fibers are pulled out of the woven structure, the continuous surface of the plastic film remains by and large completely intact with the process of the present invention. Treatment with appropriately hard brushes, as they are also sometimes used in the textile industry, grasps the naps and lengthens them considerably, resulting in a hair-like structure on one side of the s mifinished material after a brief processing period.

lengthened, while this effect does not occur when a smooth film is teased.

The processes of combing, brushing, doctoring and/or shear-squeezing, named as processing steps, all have the purpose of grasping the protuberances, naps, pegs, etc. which extend above the remaining surface, from the material of the other plastic film and to stretch them so that they are lengthened. Experience has shown that after a short while, a velour-like surface is formed from the hairs which consist of the lengthened protuberances.

Depending on the nature of the brushes and the duration of the processing, the resulting hair structures are of different average length. The temperature at which the combing, brushing, doctoring and/or shear-squeezing takes place also plays a significant role. The processing temperature can be room temperature, i.e. 20° C, but preferably it can also be raised up to 120° C, although it should be below the melting temperature of the semifinished material.

The length of the protuberances and naps prior to stretching and lengthening is between 80 and 140 µm, with a fibre diameter of at least 40 µm. The distribution density of the protuberances or hair fibers is between 3000 and 20,000 per cm^2.

For the processing steps of combing, brushing, doctoring and/or shear-squeezing, arrangements customary in the textile industry have been proven successful. For example, combing or brushing can be done with one or more napping rollers (cf. Hamann/Hoff, *Musterhandbuch der Webwarenkunde* [Pattern Handbook for Woven-Fabrics], 2nd edition, publisher: Franz Steiner Verlag, Wiesbaden, 1952). Also advantageous for the above named processes is to work with at least one brushing roller followed by a combing roller.

Preferably, processing can be done with a napped plastic material set on the surface of a drum. However, it is also possible to set the plastic material on a plane surface and to process it there.

The forces of tension, pressure and sh ar acting upon the plastic material

The forces of t nsion, pr ssure and shear acting upon the plastic material are considerabl . In many cases, inherent heating takes place. It can therefore also b advantageous to loosen the stretched hair fibres up again by brushing them with a soft brush when the actual stretching of the protuberances is completed.

It is also advantageous to treat the protuberances with a softening agent prior to combing, brushing, doctoring and/or shear-squeezing.

Plastics that have proven successful in the process are thermoplastics in the group of polyolefin, polyester, polyurethane, polyether ester, polyamide, polyesteramide as well as mixtures or copolymers of the above.

It is important that stretching is possible and that this stretching is permanent.

An arrangement for implementing the process uses a matrix surface whose temperature can be adjusted, which is provided with numerous cavities and if need be with other surface forms. It can be based on a nap or projection structure in which the length is about 80 to 140 μm and the stem or fibre diameter is approximately 40 μm. This can change, depending on the density, fibre length of the pile, and similar parameters.

The arrangement is characterized in that the arrangement with the matrix surface, such as the roller, is connected to an arrangement provided with a working surface on which the semifinished material can be set in such a way that its side covered with the fibre pile is exposed, and that processing devices for combing, brushing, doctoring and/or shear-squeezing, such as teasels, combing rollers, doctoring blades, shear-squeezing rollers, etc. are arranged in the working surface area, which can produce the hair fibres by means of stretching.

Preferably, the working surface is cylindrical and arranged on the outside of a drum, whereby the drum consists of a vacuum drum provided with numerous holes. The semifinished material is moved to and from the drum by means of a deflector roller and a take-off roller, respectively.

Distributed over th circumference of the drum and in working direction between the deflector roller and the take-off roller is at least one brushing roller and at least one combing roller.

Furthermore, the lengthening effect can be heightened by increasing the number of rollers. Thus, it is recommended that between the deflector roller and the take-off roller, a first brushing roller, a first combing roller, a second brushing roller, a second combing roller, and a third brushing roller are inserted.

The brushing rollers may consist of rotating rollers provided with steel or plastic bristles or reeds, and if need be, pile rollers can be used which the grain of the fibres can be set in a certain direction.

Claims 15 to 18 characterize certain semifinished films which are described below by means of examples. The invention also relates to hygiene products made from a film section of the above-named type.

The invention is described in detail with reference to the following drawings:

Fig. 1 shows a schematic side view of an arrangement for producing a thermoplastic semifinished material by means of a drum;

Fig. 2 shows a manufacturing process for a semifinished material lying flat;

Fig. 3 shows a section through a layer of semifinished material in accordance to a preferred embodiment.

Fig. 1 shows an arrangement for manufacturing a filmlike semifinished material in various steps. In the embodiment shown, a double-layered intermediate product is made with a nap structure of polyethylene.

From two single-screw extruders (not shown), molten and homogenized material is fed into two extruder mouths 2 or 2'. In the extruders, the compression ratio is kept at 1:2.5, while the screw temperature is kept at 250° C. The two polyethylene melts 3, 3' are applied under constant pressure to the discharge nozzles with mouths 2, 2' and to a matrix roller (4) heated to 120° C. Th rotatable matrix roller 4, which is provided with a

negatively structured matrix 5, has num rous fin cavities in the form of blind holes.

At first, the matrix roller is kept at a surface temperature of 120° C. The discharge front from the first discharge nozzle 2 is referred to as 17. The design of this roller is substantially the same as that described in German patent 195 24 076.

Ahead of the two discharge nozzles 2, 2', a vacuum chamber (6) is arranged across the entire roller width. This vacuum chamber (6) ends in corresponding abrasive ends in contact with the roller surface, so that a vacuum pump (not shown) can spread a vacuum up to the roller surface without much interference from the air that flows in laterally. Immediately ahead of the extruder mouth 2, the vacuum pressure should measure 0.25 to 0.5 bar.

The relatively high vacuum that forms has the effect that the roller surface with the matrix 5 on it is in some sections subject to vacuum pressure from the outside, whose maximum is immediately ahead of the discharge front 17 at mouth 2, so that the cavities belonging to the matrix 5 are practically void of air when the discharge front 17 reaches them. Accordingly, the cavities are completely filled by the thermoplastic melt.

The plastic entering directly into the matrix 5 is an LLDP polymer of moderate molecular weight with a melt flow index of 18 (2.16 kg/190° C). The second layer, which lies on the first and thus not directly on the matrix roller 4, consists of a polyethylene of low thermoplasticity and higher strength.

The cavities can also be evacuated from the inside of the roller 4 if a vacuum is applied there and the cavities are not blind holes, as described above, but continuous holes drilled through the mantle of the matrix roller.

In both cases, a cavity depth of 100 to 300 μm and a cavity diameter of 40 to 80 μm is desired. Preferably the filling depth is between 95 and 50% of the overall depth. In case of lower depths, it is also possible to work without a vacuum. In that cas , it is pr ferable for pressure to be exert d on the

plastic material.

The formed plastic mat rial is brought to cool down and solidify, for example by cooling it in a water bath or by means of cold air. On the side that is brought in contact with the matrix 5, the material therefore assumes the corresponding surface structure.

After solidification, the plastic material is pulled off the surface of the roller and processed further as an intermediate product 10. It is pulled off the matrix roller by means of a take-off roller 11. With the structured surface to the outside, the intermediate product moves against another rotating drum 20, which is heated to a temperature of approximately 40 to 80° C. In that state, the intermediate product pulled off the matrix roller 4 has a pile 12 that is formed by numerous naps and protuberances, lies on the surface and is not very distinctive. The height of the pile, measured from the top side of the film, is about 80 to 140 μm and has a diameter of about 40 to 80 μm. The protuberances are therefore relatively compact and are not in the form of typical fibers or hairs.

The intermediate product 10 is moved via a pressure roller 21 against the mantle surface of the rotating drum 20 where it is set by means of a vacuum. In the course of the successively continuous work stations, the intermediate product is first processed by a first teasing roller. The teasing roller 22 is provided with metal scrapers 23 which have an elastic effect due to their knee-shaped curvature. They are about 5 mm long, and the roller has a diameter of 100 mm. The scrapers 23, which grasp and lengthen the naps and protuberances, can stretch from between twice to twenty times their length. The relatively "chubby" nap protuberances are transformed into fibre-like, stretched structures, so that on the processed side of the intermediate product a fibre-like structured surface is formed, where the protrusions are lengthened into hair fibers, although on average they have not yet reached their final length.

The intermediate product is further processed in several steps. The teasing roller 22 is followed by a combing roller 24, which combs the material that is already lengthened into long hair fibers, and lays it into a certain direction. This is followed by a s cond teasing roller 25 designed similarly

to the first teasing roll r 22; it further length ns and stretch s the protuberances, naps and hair fibers. This in turn is followed by another combing roller 26, and then by another teasing roller 27. The end result is a very long-fibre almost fleece-like structure, which is hairy only on the surface while the backing is not affected as would be the case when textiles are gigged. The now completed semifinished material is pulled off via a deflector roller 28 and moved to a storage container or cutting station.

Instead of the teasing brushes 22, other brushes or scrapers can be used to lengthen and stretch the protuberances. The important thing is that the initially present relatively flat structure is stretched through brushing or shear-squeezing, whereby on average, the length of the protuberances of the pile is increased to at least twice its original length. Generally, higher values are reached, i.e. the protuberances are stretched by more than ten times the original length.

To keep the intermediate product on the mantle surface of the drum 20, a vacuum is built up inside the drum 20. By means of appropriate perforations 33, the flexible intermediate product is pulled against the mantle surface. Outside the processing zone, which is defined by the processing regions of the two teasing rollers 22, 27, the perforations 33 are covered by a skirt 34, so that the material can be easily pulled off without damage shortly after the beginning of the skirt.

Preferably, processing on the mantle of the drum 20 is done above room temperature, for example between 40 and 120° C, but below the melting temperature of the semifinished material. The lower initially upper layer of the intermediate product, which is somewhat harder, is not touched or damaged by the lengthening and stretching processes and therefore remains as an excellent substrate for the film that is being manufactured as a semifinished material 31.

Suitable thermoplastics are polyolefin, polyester, polyvinyl alcohol, polyurethane, polyether, polyamide, polyesteramide as well as mixtures and copolymers of these; in case of several layers, it is also possible to alternate between materials.

A wide spectrum of plastics is available to the skilled artisan, depending on the desired application. In particular for hygiene articles, chemically neutral polyolefins would be chosen, which are adjusted to certain melting temperatures and strengths.

In addition to the formation of fibers, it is also possible to perforate the film or to laminate it to another substrate. The possibility of applying a textile or fleece material to the reverse side of the film should not be ruled out either.

In variation 1, an already coextruded mono-layer or multi-layer film can be used whose layer coming in contact with the matrix roller 4 becomes so workable and liquid in the molten state that by means of a vacuum it penetrates the corresponding cavities on a corresponding matrix 5 where it forms the napping and protuberance structure that is characteristic for the intermediate product 10 after leaving the matrix surface. In that case, the extruder mouths 2, 2' are replaced by corresponding pressure rollers (not shown) which press the supplied film material against the matrix roller. After the surface is formed into an intermediate product, it is processed as already described for Fig. 1.

We therefore assume a multi-layered film that is manufactured by means of a multi-layer extrusion process. Preferably, the reverse side of the film consists of a viscous polymer, with a relatively high mechanical load capacity, e.g. with an MFI of about 2 to 3 and a thickness of 20 to 50 μm. The reverse side itself can be multi-layered. The layer can also be filled, so that stretching results in microporosity. The top side, on the other hand, which later is to become a velour layer, is produced from a polymer with an MFI of 18 to 30 and at a layer thickness of 20 to 60 μm. The formula for the top side must result in easy flowability and easy workability.

By using a multi-layer film, it is possible to produce films whose surface is easily workable; the viscous reverse side layer is provided with the properties necessary for further processing. The different formation behavior is of particular importance in determining and controlling the penetration depth into the cavities of the forming tool.

Fig 2 shows a processing version in which th intermediate product is

To start with, the intermediate product 10 is applied with relatively short, stubby naps or protuberances and then treated with a brushing roller 32 provided with steel bristles. Here, too, the protub rances of the original pile are lengthened and stretched by at least twice the original length, resulting in a semifinished product 31 which has a fibrous structure on at least one side. To avoid excessive tensile forces, the material is advanced in repeat fashion, and the roller is run over the material that is being treated in each case. Here, too, several teasing rollers, brushing rollers and pile rollers can be used in succession.

Fig. 3 shows an enlarged view of a filmlike semifinished material manufactured according to the described process and consisting of three layers. The surface of a highly viscous substrate layer 37 of good mechanical stability, made of HDPE, is provided with a polypropylene layer 38 which is provided with a hair-fibre pile 39 produced according to the described process. The thickness of the formed layer 38 is about 20 to 30 μm, while the substrate layer 37 has a thickness of 30 to 40 μm.

The substrate layer 37 made of HDPE, on the other hand, is bonded to a fleece layer 40, whereby all the material is perforated (perforations 41), so that both sides of the filmlike semifinished material have a soft pile and are water absorbent, a vapour and moisture exchange can take place from one side of the film to the other.

By means of pile rollers (known from prior art), the grain of the film-like semifinished material can also be set in certain directions including variable directions.

Other types of treatment not using brushes are possible as well. An effect in which the naps are lengthened into hair fibers can be achieved by means of teasing.

Generally, the arrangements facilitate squeezing, i.e. holding the protuberances by their roots, and the simultaneous lengthening of the freely ending sections above the roots of the protuberances.

The following two examples ar characteristic manufacturing variants:

Example 1:

By means of a multi-nozzle apparatus with at least two extruders, a film combination is produced which consists of a formed top film 25 µm ± 2 µm in thickness and a carrier film 30 to 40 µm in thickness. The polymer for the 20 µm thick top layer consists of 30 parts of an HDDPE material with a melt index of 30 (measured at 190 ° C/2.16 kg) and a density of 0.902 g/cm^3, and 70 parts of an HDDPE with a melt index of 30 and a density of 0.885 g/cm^3.

The carrier film is made from an HDDPE of normal consistency, optimized for the production of soft PE film with a density of 0.930 g/cm^3 and a melt index of 2.1 (190° C/2.16 kg).

On a matrix roller 4, this combination is discharged from the extruder, and the workable top layer is brought in direct contact with the matrix roller. The air is pressed out of the cavities of the matrix roller and toward the inside, while the soft, flowing polymer layer fills the cavities.

After cooling, the intermediate product is pulled off the matrix roller 4. The result is a film that is treated with two teasing-brush rollers of the type described above, and with one combing roller. This results in a filmlike semifinished product with a long pile.

Example 2:

By means of an apparatus with two extruders, a 60 µm film is produced, whereby the workable top layer of the film has a thickness of 20 µm ± 2 µm, and the carrier layer has a thickness of 40 µm ± 5 µm. A mixture of two polymers of different densities is selected for the top film. These are two HDDPE products made according to the *Metallocen* process which are offered by Dow Chemical under the trade-name of Insite-PE-Plastomer. The mixture consists of 30 parts of Affinity HM 1250 with a melt index of 30 and a density of 0.885 g.cm^3. The carrier film is an HDDPE with a melt index of 2.1 and a density of 0.920 g/cm^3.

Lubricating agents, pigments, stabilizers and release agents are added at a rate of 10% by weight.

Lubricating agents, pigments, stabilizers and release agents are added at a rate of 10% by w ight.

The film is made according to the so-called chill-roll process. The film is treated on a table; following two runs through a teasing roller, the result is a dense fleece-like pile.

The film-like semifinished product made according to the description and the examples is suited for many different applications. In particular, one such film is used for hygiene products, but this type of film can also be used in the handbag and garment industry.

Such films can also be used as fabric for furniture and automotive upholstery. In combination with suitable carrier substances, the films can also be used in the clothing industry, in the upholstery fabric industry, for automobile ceiling fabrics, grill cloths, etc., which means that they have a wide spectrum of applications.

The films may have one or more layers. It is also possible to make films with both surfaces raised in the form of velour. The material can be laminated and bonded with various other materials. It is also possible to weld two films together whose outer surfaces are smooth and which have a middle layer of fibrous material, to produce a film used for drainage purposes.

CLAIMS

1. Process for manufacturing a film-like surface-structured semifinished product (31) from a thermoplastic, with the following processing steps:

   a thermoplastic material is applied in molten state or in the form of a film to a surface (5) processed into a structure that is the negative matrix (5) of the desired structure and is provided with fine cavities, in particular with drilled holes;

   the matrix (5) including the cavities is at least partly filled by the thermoplastic material;

   the formed thermoplastic material is solidified through cooling, whereby its side which is in contact with the surface assumes the appropriate surface structure;

   after solidification, the plastic material is pulled off the surface, whereby the thermoplastic material that has penetrated the cavities and is pulled out of these cavities now forms a pile (12) consisting of protuberances, characterized in that the protuberances forming the pile (12) are stretched by means of combing, brushing, teasing and/or shear-squeezing, whereby the protuberances of the pile are lengthened to at least twice the original length, resulting in a semifinished product (31) that has a fibre-like structure on at least one side, on which the protuberances have been lengthened into hair fibres.

2. Process according to Claim 1 characterized in that the surface is subjected to a vacuum pressure from the outside or the inside, so that the cavities belonging to the matrix (5) are evacuated, and the plastic material is better able to flow into the cavities.

3. Process according to Claim 1 or 2, characterized in that the length of the protuberances and naps prior to stretching and lengthening is between 80 and 140 μm at a fibre diameter of at least 40 μm.

4. Process according to Claims 1 to 2, characterized in that th distribution density of th protub rances or hair fibres is between 3000

and 20,000 per cm^2.

5. Process according to at least one of the previous claims, characterized in that combing or brushing is done with one or more napping rollers (22) or at least one brushing roller and a combing roller (24, 26) that follows the above.

6. Process according to at least one of the previous claims, characterized in that the combing, brushing, teasing and/or shear squeezing is done in relation to a plastic material that is set on the surface of a drum (20) or on a plane surface.

7. Process according to at least one of the previous claims, characterized in that after the combing, brushing, teasing and/or shear squeezing, the stretched hair fibres are loosened up by brushing with a soft brush.

8. Process according to at least one of the previous claims, characterized in that the combing, brushing, teasing and/or shear squeezing is done at a temperature between 20 and 120° C, but below the melting temperature of the semifinished product (31).

9. Process according to Claim 7, characterized in that prior to the combing, brushing, teasing and/or shear squeezing, the protuberances of the pile (12) are treated with softening agents.

10. Process according to at least one of the previous claims, characterized in that the selected thermoplastic comes from the group consisting of polyolefin, polyester, polyvinyl alcohol, polyurethane, polyether ester, polyamide, polyesteramide as well as mixtures and copolymers of these.

11. Arrangement for implementing the process according to Claim 1 and if need be according to other claims, with a matrix surface whose temperature can be adjusted and has a structure consisting of numerous cavities, characterized in that the arrangement with the matrix surface, such as the matrix roller (4), is followed by an arrangement provided with a

working surface on which the semifinished product (31) is set in such a way that its side to be cov r d with th fibrous pile is exposed, and that working arrangements for combing, brushing, teasing and/or shear squeezing, etc. — such as teasels, combing rollers. brushing rollers, etc. — are arranged with which the hair fibers can be produced.

12. Arrangement according to Claim 11, characterized in that the working surface is cylindrical and arranged on the outside of a drum (20), preferably a vacuum drum provided with numerous openings.

13. Arrangement according to Claim 11, characterized in that the brushing rollers consist of rotating rollers provided with steel bristles or reeds, or of pile rollers.

14. Filmlike semifinished material or product, in particular hygiene product, with hair fibers, manufactured as a mono-layer or multi-layer product, whereby the hair fibers originate in protrusions which are lengthened to at least twice the original length.

15. Filmlike semifinished material or product according to Claim 14, consisting of two layers, characterized in that the layer provided with a pile (12) consists of a polymer that flows more easily when heated, while the reverse side layer consists of a more highly viscous polymer.

16. Filmlike semifinished material or product with a fibrous pile (12) according to Claim 14, characterized in that the hair fibers are of polymer made according to a *Metallocen* process.

17. Filmlike semifinished material or product with a fibrous pile (12) according to Claim 14, characterized in that the side opposite the fibrous pile (12) is connected with a carrier material, such as a woven or knit fabric or a fleece fabric.

18. Filmlike semifinished material or product with a fibrous pile (12) according to Claim 14, characterized in that the hair fibers consist of a mixture of at least two polymers of different density.

Abstract

(See Fig. 1)

The invention relates to a process for manufacturing a filmlike surface-structured semifinished material from a thermoplastic.

First, a thermoplastic material is applied in molten state or in the form of a film to a surface (5) processed into a structure that is the negative matrix of the desired structure and is provided with fine cavities.

After solidification, the plastic material is pulled off the surface, whereby the thermoplastic material that has penetrated the cavities and is pulled out of these cavities now forms a pile consisting of protuberances. The protuberances forming the pile are stretched by combing, brushing, teasing and/or shear-squeezing, whereby the protuberances are considerably increased in length.

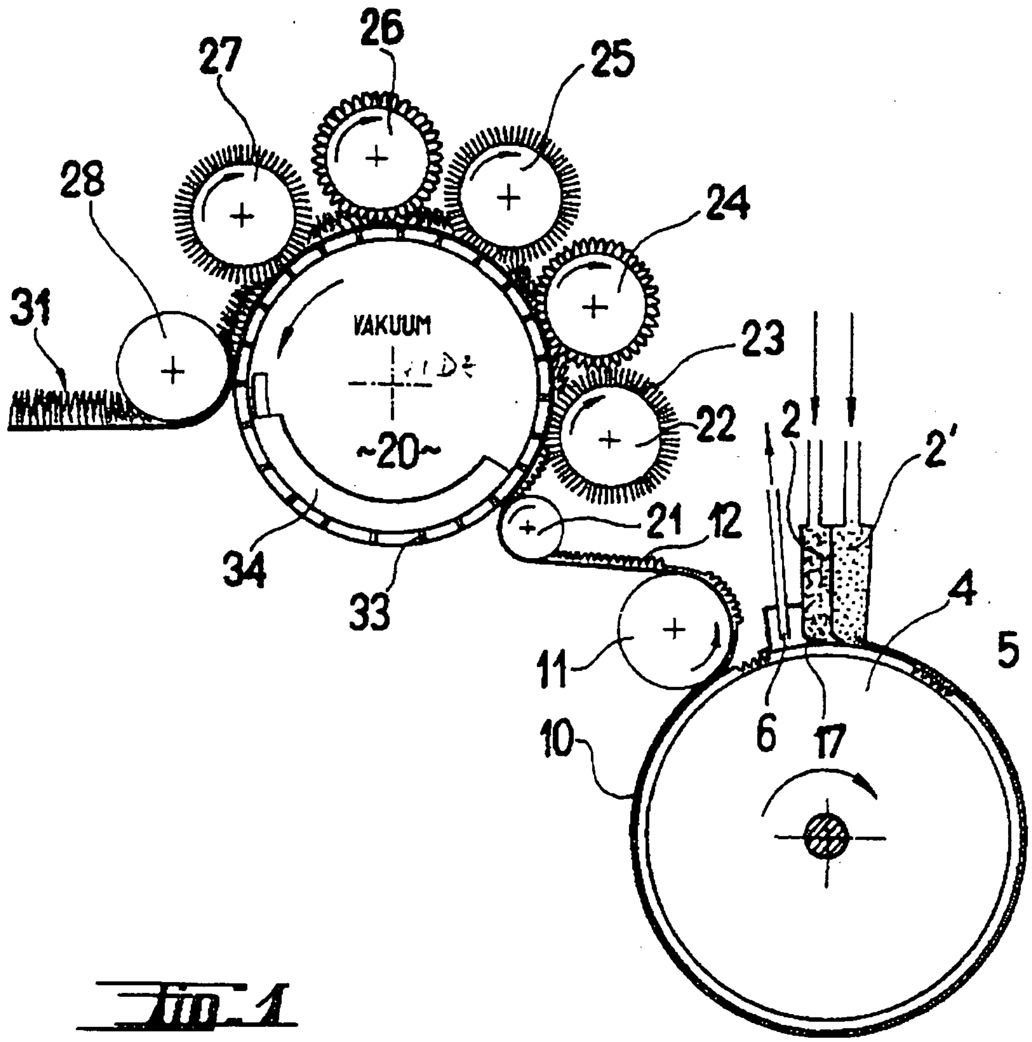


Fig. 1

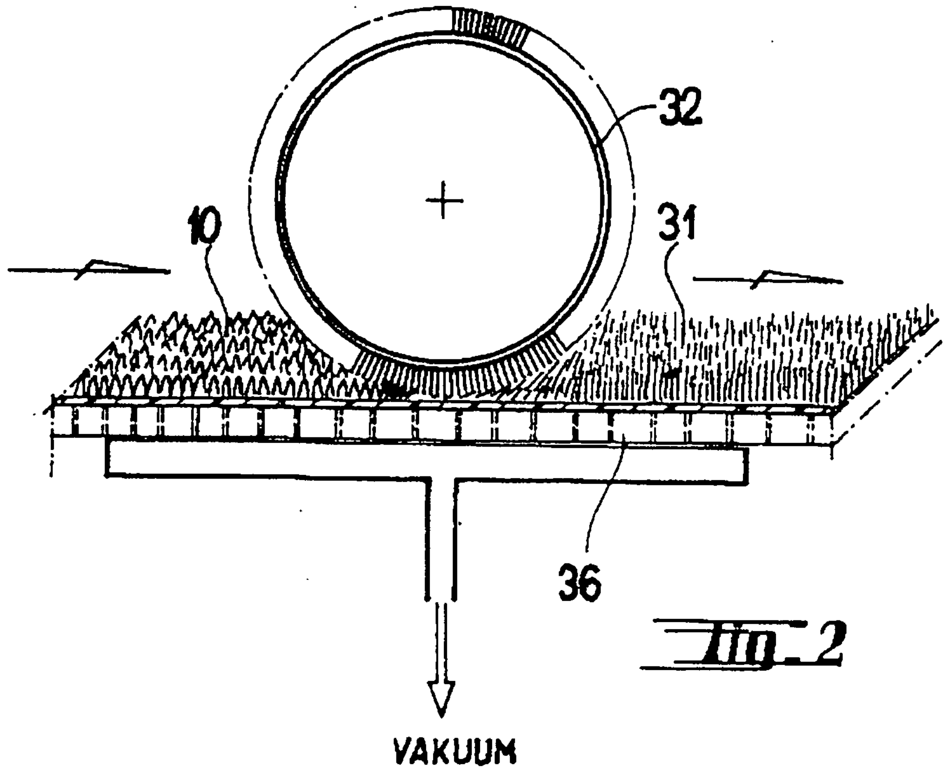


Fig. 2

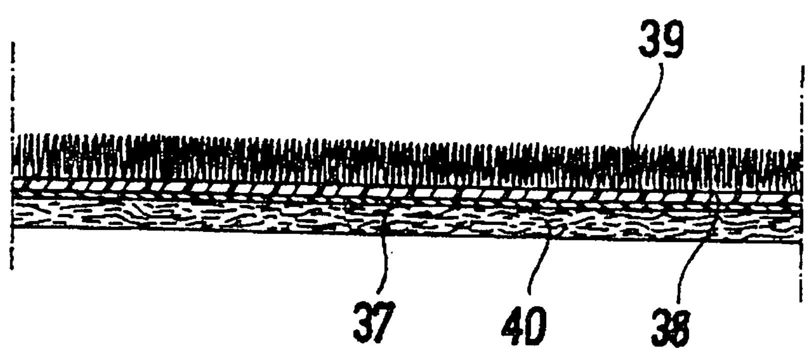
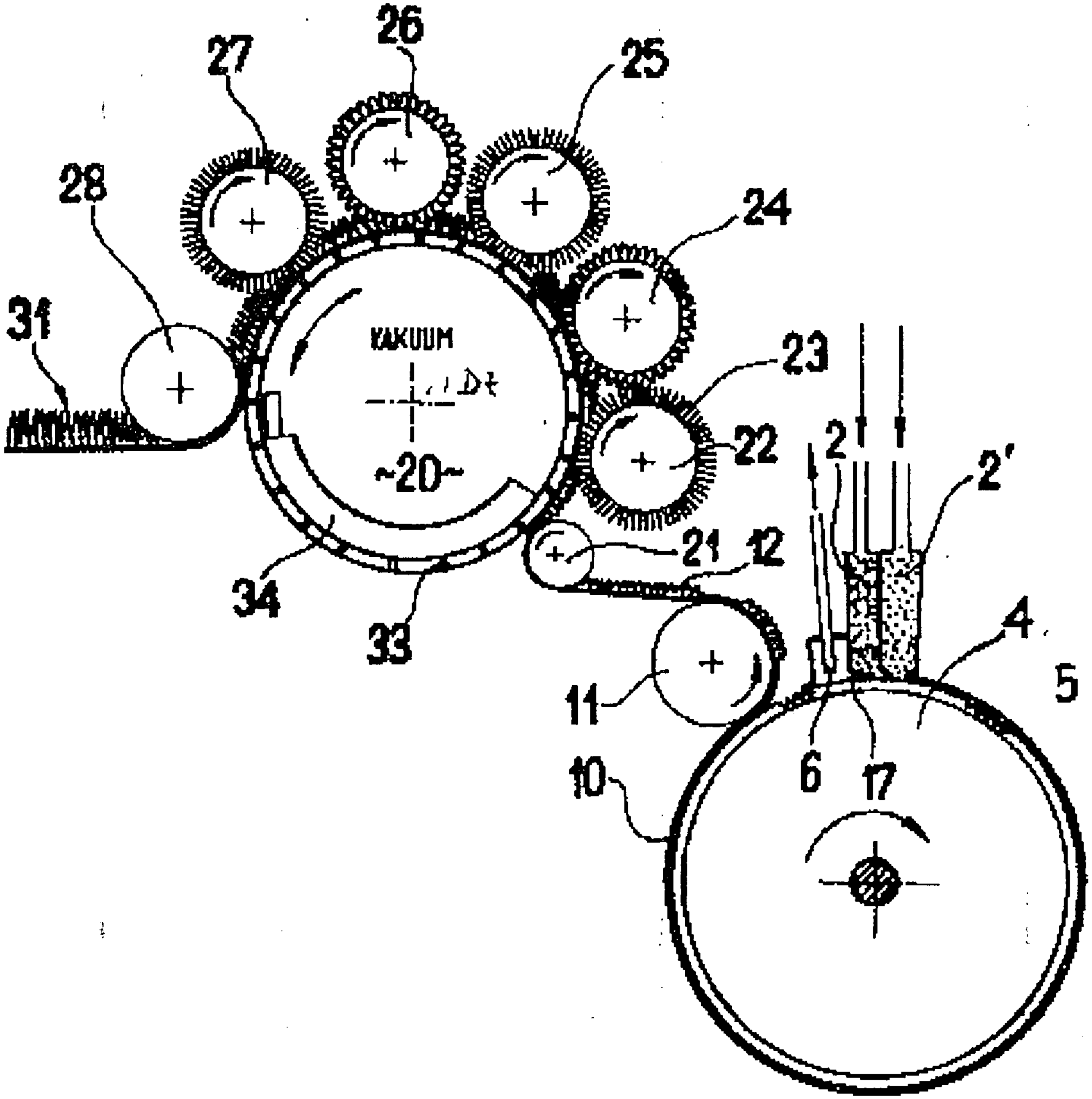


Fig. 3



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